

# “Crucible Steel of America”

*50 Years of Specialty  
Steelmaking in U.S.A.*

WILLIAM H. COLVIN, JR.





*“Were American Newcomen to do naught else, our work is well done if we succeed in sharing with America a strengthened inspiration to continue the struggle towards a nobler Civilization—through wider knowledge and understanding of the hopes, ambitions, and deeds of leaders in the past who have upheld Civilization’s material progress. As we look backward, let us look forward.”*

—CHARLES PENROSE  
*Senior Vice-President for North America  
The Newcomen Society of England*



*This statement, crystallizing a broad purpose of the Society, was first read at the Newcomen Meeting at New York World’s Fair on August 5, 1939, when American Newcomen were guests of the British Government.*

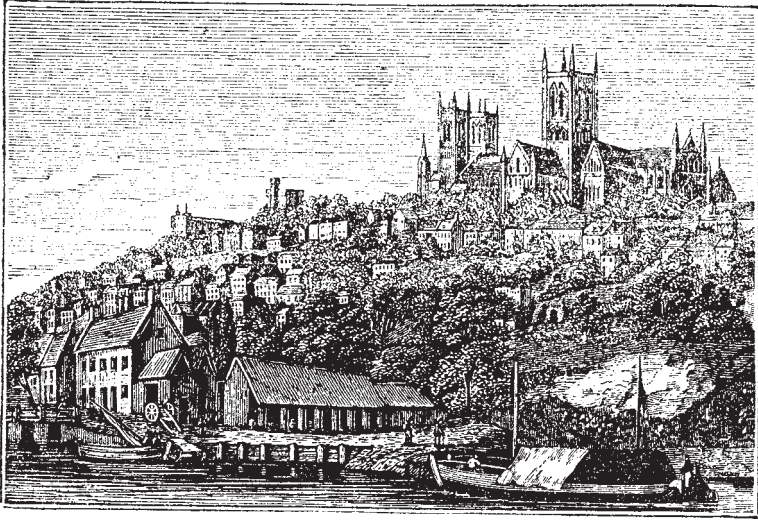
*“Actorum Memores simul affectamus Agenda”*

“CRUCIBLE STEEL OF AMERICA”  
*50 Years of Specialty Steelmaking in U.S.A.*



AMERICAN NEWCOMEN, *through the years, has honored numerous industrial organizations in the United States of American and in Canada, and has honored the memories and work of those pioneers who vision, courage, initiative, self-reliance, seasoned judgment, and unfaltering Faith have laid the foundations and made possible the continuance of what grew to be internationally-known industries. Such a Newcomen manuscript is this, dealing with the beginnings and growth and influence of Crucible Steel Company of America and in observance of its 50th Anniversary. It is a recital told clearly and with marked human interest. It shows circumstances and factors, both within the fields of economics and of inventive development which it is well should be known at this time—in the national interest.*





“We are gratified that American Newcomen has seen fit to honor the Crucible Steel Company of America here tonight at New York, in this, *our fiftieth year.*”

—WILLIAM H. COLVIN, JR.



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Steelmaking in U.S.A.*

WILLIAM H. COLVIN, JR.

MEMBER OF THE NEWCOMEN SOCIETY  
PRESIDENT  
CRUCIBLE STEEL COMPANY OF AMERICA  
NEW YORK



THE NEWCOMEN SOCIETY IN NORTH AMERICA  
NEW YORK      SAN FRANCISCO      MONTREAL

1950

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WILLIAM H. COLVIN, JR.



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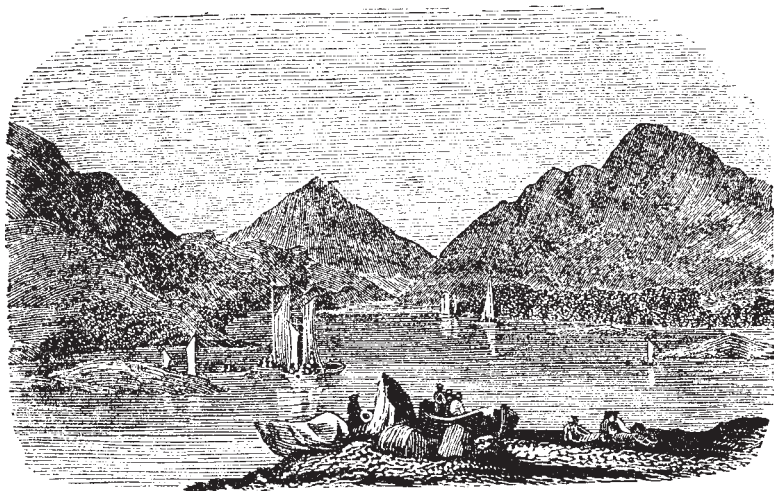


*This Newcomen Address, dealing with the his-  
tory of Crucible Steel Company of America  
and marking its 50th Anniversary, was deliv-  
ered at a National Newcomen Dinner of The  
ewcomen Society of England, held in Ball-  
room of The Pierre, at New York, N.Y., U.S.A.,  
hen Mr. Colvin was the guest of honor, on  
March 28, 1950*



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“In its own times, Crucible Steel Company of America and its able competitors in the specialty steel industry have performed the role of metalsmiths to the inventive and industrial builders of our century. In its fifty years of specialty steelmaking, Crucible has served the innovators who introduced country-wide electrification, the streamlined train, the automobile, the airplane, the bus, and the truck. It has turned out steels of rare quality to help release the power of the atom, and to build the prototypes of jet and rocket ships that someday may escape the Earth’s gravitation altogether for travel into space.”

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## Biographical Sketch of The Author

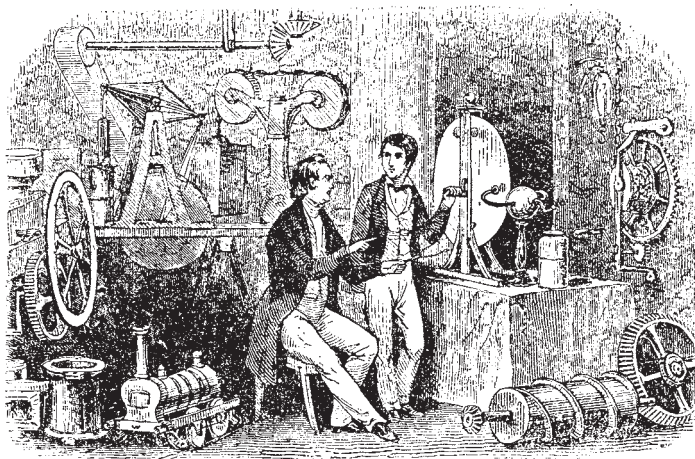


*Sheffield in the West Riding of Yorkshire, famed British center of Steelmaking, and the pioneer work of Benjamin Huntsman (1704-1776) become a colorful background for this Newcomen manuscript. Sheffield, situated at foot of the Pennines and at junction of the River Don with its tributaries the Sheaf, the Porter, the Rivelin, and the Loxley—Sheffield, with its 13th Century castle and its famed old parish Church of St. Peter and St. Paul, later became cathedral, and its 14th Century tower—this city and its treasures are enduring memorials to countless English Kings and to the progress of British Industry through the centuries. This background arises because of Benjamin Huntsman's brilliant genius in developing Crucible Steel, about the Year 1740, as explained herein. None better could tell the story of America's important contributions in that same field than WILLIAM H. COLVIN, JR., of New York, President of Crucible Steel Company of America. Native of Chicago and graduate of Cornell University, in the Class of 1920, Mr. Colvin was brought up in an atmosphere of big business, because his father, William H. Colvin, Senior, was a distinguished financier and broker in Chicago. His first position was in the Bond Department of Harris Trust & Savings Bank of Chicago. During the next ten years he broadened his experience as an investment banker in this Country; and also spent a year in Great Britain and a short time on the Continent. In 1931, he entered the Steel Business as Treasurer of Rotary Electric Steel Company of Detroit, becoming its President in 1936; which position he held until invited to become President of Crucible Steel Company of America, in 1945. During the First World War, he served as a 2nd Lieutenant of Infantry in the United States Army, completing his college course after the Armistice. Steel manufacturer, business executive, student of industrial history, good citizen, Mr. Colvin is a member of the New York Committee, in The Newcomen Society of England.*



HIS MARK





*My fellow members of Newcomen:*

**W**E ARE gratified that American Newcomen has seen fit to honor the Crucible Steel Company of America here to-night at New York, in this, *our fiftieth year.*



The Newcomen Society is devoted to intensifying our appreciation of the accomplishments of the American and British peoples in the arts and sciences. Thomas Newcomen, for whom the Society is named, was one of the real pioneers of industry. Now, I am sure that during the period, at the beginnings of the 1700's when Newcomen was thinking about the building of his steam engine, he had many a discussion—no doubt some of them heated—with the metalsmiths of his neighborhood. He told them what he needed and, we can assume, he did not just take what they offered. Newcomen's suppliers had to turn out metalwork to his specifications, and some of it quite probably represented types they had never thought of before. At the same time, they in turn undoubtedly influenced Newcomen with their special knowledge of what could and what could not be accomplished in the metalworking arts of their times. They served the needs of an inventive and industrial genius to whom we all are indebted. Though their individual efforts may not now be remembered, we can assume that they contributed in an essential way to the success of his efforts. Ever since

that time, this fruitful relationship between metalsmith and innovator has been a powerful force in the development of industry and in the unfolding of our technological age.



It is to such metalworkers and their successors over here, the specialty steel companies of America, that I particularly want to call your attention tonight. You may find it rewarding, because their development and their problems symbolize not only the enormous variety and growth of our modern technology, but also the sometimes hidden and subtle effects of today's social changes upon the kind of institutions which have helped to make us what we are—changes which may inadvertently prevent some kinds of businesses from continuing the full measure of their contributions to future developments in the same unfettered way as in past industrial eras.



In its own times, Crucible Steel Company of America and its able competitors in the specialty steel industry have performed the role of metalsmiths to the inventive and industrial builders of our century. In its fifty years of specialty steelmaking, Crucible has served the innovators who introduced country-wide electrification, the streamlined train, the automobile, the airplane, the bus, and the truck. It has turned out steels of rare quality to help release the power of the atom, and to build the prototypes of jet and rocket ships that someday may escape the Earth's gravitation altogether for travel into space. It also has provided steel for innumerable less dramatic uses—those everyday uses to which the modern American industrial system owes its great growth and in some cases its existence.



Basic steels are needed in such quantities that they can be produced economically by mills that turn them out almost automatically in quantities of many hundreds of tons, or by the mile. These are the products that make up the principal business of the big steel companies—the tonnage producers whose names are so familiar they have come to typify the steel industry itself.

But by contrast, there are literally thousands of *special types* of steel which must be so carefully compounded, or so sensitively handled, or produced in such small quantities, that they cannot, as an actual, practical matter, be made by mass production. These are the steels that are great, but in little ways: small-quantity metals without which the big-quantity metals could neither be produced nor worked. They include, for example, the *tool steels* which put the teeth in machines to cut the metal parts from which other machinery is made. They include metals intended for use under special or severe conditions of heat or cold, stress, strain, or corrosion. They include steels for vital parts, such varied and important steels as those for valves, springs, plows, hacksaws, turbines, needles, knives, jet engines, razor blades, bearings, typewriters, magnets—and many more. Every year, additional steels must be developed or invented to fit the myriad uses to which these versatile metals are put.



Crucible's catalogues and those of our competitors offer literally thousands of kinds of products. In 1950, moreover, we shall undoubtedly make types and shapes that we never have produced before, tailor-made to new and exacting specifications laid down by our customers in terms of requirements of their applications. It would, in fact, be hard to conceive of our World without these special metals and the craftsmen who can mix and shape them in the specialty steel plants of the Country.



Yet, despite their importance, many of the specialty enterprises in our Nation, including with particular emphasis the specialty steel group, seem to have become anachronisms in an American industrial world. The mass patterns governing so much of industry today tend to ignore the usefulness of these activities and in the race for uniformity to brush aside all possible consequences.



Crucible and its competitors are a part of the great Steel Industry. We are intensely proud of it! Yet there is real danger that

the forces being brought to bear upon us, through the very environment we have helped to bring into being, may handicap the operation of specialty steel producers.



Let us take a glimpse into the past. The name of Crucible was taken from a steel-making process originated in England in the 18th Century, which later was shared with the New World as English craftsmen settled here. It was a result of the growing demand for better steels, and the never-ending search for ways to improve the metals needed by the burgeoning growth of industry.



The story goes that the crucible process was discovered, not by a professional steelmaker, but by Benjamin Huntsman, a clockmaker of Sheffield, England. Huntsman became interested in steel-making methods around 1740, when he found he needed better steels for parts of his timepieces and was unable to get suitable metal from any suppliers in his neighborhood.

The process he finally developed consisted of melting iron in the presence of purifying elements in small crucibles, under controlled conditions. By this method he succeeded in making the best steel that had been produced in England up to that time. He soon found he had a market for it far beyond his own clockmaking requirements, and accordingly built a works on the outskirts of the village of Sheffield. In order to protect his art from pirating, he swore his workers to secrecy. (Secrecy for many years was a tradition of the specialty steel industry, with the art of making the early alloy steels usually a closely held "family" affair.)



But, as is always the case, Huntsman's success was a challenge to others. One of them set out to discover his secret. One evening a tramp knocked on the foundry door and begged permission to dry himself by the furnace fire. All that night he drowsed near the crucibles as Huntsman's secret mixtures of iron and alloys were melted and fused into molten steel.

The tramp's visit was scarcely forgotten before Huntsman had a competitor. The tramp had been a spy. Following Huntsman, many crucible steel plants were started in Sheffield, and this city rapidly became the major fine steel manufacturing center of England.



The manufacture of refined steel was first started in America, in Connecticut in 1728. The process was one in which bar iron was converted into steel by methods then already well known. A little later, the superior crucible process was brought to the colonies by craftsmen emigrating from Sheffield and from other iron and steel centers of Europe. For more than 160 years the crucible method of making fine steels was considered the best available.



The introduction of the crucible process generally marks the beginnings of the specialty steel industry as we know it today. At first, of course, the number of *kinds* of special alloy steels was limited. The quality varied considerably, not only from mill to mill, but from batch to batch. Modern methods of analysis, quality control, and accurate processing had yet to be developed, and were slow in coming, since they depended upon modern chemical and metallurgical methods, which in turn awaited the growth of the sciences of physics and chemistry.

But the old craftsmen were quick to work out effective rule-of-thumb methods, based upon experience, and some of these methods have use and validity to this day. Specialty steelmaking is still much of an art. It probably will long remain so. In some ways it is a futile to consider reducing fine cooking to an exact science as it is to think of entirely replacing by strictly scientific methods the art and craftsmanship of specialty steelmaking. Nevertheless, it is the constantly increasing application of scientific checks, controls, and analyses that have made today's specialty steels what they are.



1950 is *the fiftieth anniversary* of the formation of the Crucible Steel Company of America. Strictly speaking, it is not a birthday. Crucible was formed in 1900 by the consolidation of some thirteen

specialty steel companies which banded themselves together to enjoy the advantages of integrated operation. One of them, the Anderson DePuy Company of McKees Rocks, Pennsylvania, was even then 55 years old. The other twelve companies ranged in age from 8 to 52 years.

In 1900, when the articles of incorporation of Crucible were filed, the founders declared that they would produce: "crucible and open hearth steel; merchant bar and rolled bar steel; tool, die, file, plow and machinery steels; boiler plates; drawn wire; drill rods; carriage and railroad spring and axles; ordnance and projectiles."

Thus Crucible defined its field with minor exceptions as one of high quality, but not tonnage—a business definition representative then, and now, of the specialty steel industry.



The formation of Crucible made the company the largest crucible process producer in the World. Further, the Crucible family of mills at that time incorporated equipment and know-how for almost every type of specialty steel required by the fast growing American industrial machine.



The advent of electric arc melting, in 1906, spelled the doom of the crucible method of making fine steels, although customers retained their affection for it, during another thirty-odd years. The first Heroult electric furnace in America was installed in our Halcomb Works in Syracuse, New York, with the noted Frenchman, Heroult, and his associates on hand. That same first electric furnace now is proudly displayed in front of the office building at the Sanderson-Halcomb Works of Crucible, at Syracuse.



In order to assure itself of an adequate supply of iron and steel, Crucible built its midland works on the Ohio River, near Pittsburgh. It was developed into an integrated operation with its own

coal, coke ovens, blast furnaces, and open hearths. Rolling mills and processing equipment to reduce ingots into finished and semi-finished products were installed; and, later, the company became part owner of a Minnesota iron ore mining company to complete its full integration.



The roots of our company, therefore, go back well over a century, and when the organization was consolidated in 1900 it represented then—as we hope and believe it still does today—the finest skills and traditions of the specialty steelmaking art. Its products were surpassed nowhere on Earth, and for many years the Crucible Company supplied not only a substantial share of the specialty steels required in our own Country, but exported to many foreign countries, including England. During the early part of the century, Crucible steels helped tool the growing industries of the World. They helped produce the weaving machinery of England, the chemical plants of Germany, the industries of the Swiss. Crucible drill steels helped open up the gold and diamond mines of South Africa.



We were by no means the only American specialty steel company to share these worldwide honors. Our competitors then, as now, were alert and progressive. Their excellent products pushed us hard for the markets of this Country and the World—all of which was as it should have been.



In the specialty steel industry at the turn of the century, there was much of the traditions and methods of early times still prevailing. They continue to an important extent today, and that fact marks a sharp difference between those lines of work which lend themselves readily to modern mass production methods, and the specialists whose markets and necessary methods of manufacturing are out of harmony with mechanical, repetitive, volume production. The demands of a vast market for similar products call for the creation of the means for mass production; high standards of living require the maximum substitution of mechanical for human

energy, thus reducing as far as possible the labor content of the unit produced. However, market demands which call for special products, dissimilar, infrequently repeated, in small lots and for particular applications, cannot be served by mass production methods. It is not a matter of modern *vs* old machinery, or new *vs* antiquated engineering, or indifference to obsolescence; it is a fundamental basic difference in the job to be done.



At the turn of the century, the mass production of raw steel was already here. The conversion of the raw steel into its usable forms was in part responding to mass demands by the creation of mechanical facilities of large productive potential, but it was also in part still heavily relying upon old methods, awaiting the development of mass markets. The period of great railroad building created a mass demand for rails, car plates and the like, and brought into being new means to amply supply them. The demand for wire following the opening of the West to farming, in effect, created the continuous rod mill. One example after another could be cited. As late as 1930, however, substantial proportions of the raw steel melted was still reduced to its finished forms for the market by old, largely traditional methods, including, of course, that segment of the industry represented by the specialty steel producer.



A turning point had been reached, on Thanksgiving Day 1926, when the World's first continuous hot strip mill went into action. The demands of the automotive industry, the container industry, and others created that mill. They wanted low cost, more consistent material in huge amounts; and they got it. Within ten years, the product of these mechanical mills had almost completely replaced the former hand mill sheet, and the steel industry reached its present state at which between 85 percent and 90 percent of its total tonnage is finished by highly mechanized, low labor content, repetitive, mass production facilities.



The always small percentage of the total production represented by the specialty steel producer then became, and for the first



time, a major proportion of the little remainder which could *not* be so produced. That is to say, by 1936, the output of specialty steel producers became a part of a now wholly insignificant percentage of the total steel production. Its problems therefore also became insignificant within the industry, and to a new force which was about to appear and to bring about fundamental changes in the mills.



In 1937, a horizontal, plant and industry-wide union—The United Steelworkers of America, C.I.O.—took over the responsibility for the terms of employment of production and maintenance workers in steel.



A whole series of horizontal wage increases throughout the steel industry, and many expensive fringe benefits, horizontally applied, increased over-all wage costs faster than labor-saving facilities could be engineered, or for which increased productivity would compensate. Hence, of course, there were price increases in steel. In the specialty steel plants, however, the possibilities of such engineering advances are limited for the reasons given; and so, too, are the opportunities for the workers, regardless of how well intended, to increase their own productivity. Such circumstances should call for price increases in special steels greater on the average than for tonnage steels. Here, however, the competition of other metals and of other methods of producing parts may, and often does, prevent the prices of these more costly materials from reflecting the full measure of increasing plant-wide rates of pay and changes in terms of employment as they affect production costs. Foreign competition, encouraged by falling tariffs and based on cheap labor, discounted further by cheap money, cannot be ignored in tampering with prices. The adverse result of this combination of circumstances has been a range of attainable price increases substantially less—instead of more—than that realized for tonnage steels. Thus the patterns of wages and prices which have developed as a result of the circumstances affecting the significant tonnage production has created a squeeze upon the insignificant specialty producer and presents a problem which at the moment remains unresolved.

This does not mean that specialty steel companies will quit or go to the wall. It does suggest, however, that important segments of their business may suffer from the neglect which unsatisfactory operations encourage. The fantastic volume created by war needs for specialty steels hid for a time the damages being done to the long range position of these producers, but energetic steps have since been taken materially to improve the situation in anticipation of the events foreshadowed here, and to get a foot over into the other camp.



But, this specialty business as such is certainly threatened—and with it, in my opinion, there is a threat of considerable magnitude and immediacy to American security and future development. This threat has been little recognized outside of the specialty steel industry—but it should no longer go unheralded. It poses a special kind of question to our Country. The question is this: Do we want to drive the specialty steel business back to Europe from whence it came?

For the specialty steel business is a natural for the countries of Western Europe, especially England, Sweden, Luxembourg, Austria, Germany, and Belgium. The industry came from these countries initially, migrating to America as the land of opportunity for useful enterprise. But as the mass production pattern grows—as the economics of labor and other costs become geared to mass production without regard to the simple facts of the more specialized businesses—the specialty steel industry, as we know it, will surely be driven in part at least, to return from whence it came.



Now, what would America lose if the specialty steel industry returned to its native home in Europe? In time of war, the serious effect would immediately be apparent. We could hardly stockpile specialty steels in quantities sufficient to keep us going for any length of time. The stockpiles would have to be used in the construction of planes and ships to outweigh an enemy drive against commerce—enough planes and ships to bring fresh supplies of such steels *back* for the manufacture of armaments of war, and *if* the

European productive capacity was still intact. Tool steels are vital to all metalworking industries. A country without them is in trouble at the start. To a less obvious but perhaps equally important degree, many other kinds of special steels are vital to the safety of the Nation. Starting from scratch, who would produce the new, high-temperature steels which the advances of science are demanding. Today, in contrast to the time of the First World War when alloy steels contained only low amounts of alloying materials, we are supplying a steel with these elements: Cobalt 40 percent, Chrome 20 percent, Nickel 20 percent, Molybdenum 4 percent, Tungsten 4 percent, Columbium 4 percent, and Iron not more than 5 percent. Processing this sort of material is a job for the specialist, without him *who* could produce such steels for jet engines and guided missile motors? Where would we get the needed volume of turbine steels, the special alloys for gun parts, and the like? And would research and the development of new devices be as freely undertaken if it were necessary to explain to some European manufacturer what kinds of new experimental steels were needed, and thus perhaps give him insight into the uses for which they were required?



But grave as may be the threat to the Country's ability to protect itself, there is probably no less danger to its continued development in time of peace if many of the special metals must be obtained from foreign suppliers. Could we then obtain the fruitful collaboration between inventor and metalsmith such as I envisioned a sort while ago as between Thomas Newcomen and the metal-makers of his time? Today, the special steel producers and the inventors and developers of new products and new industries work hand in hand, each contributing of his special skills to the final result. Could American innovators expect such vital and ready cooperation from foreign manufacturers?



As I have said, the Crucible Steel Company of America and its principal competitors will not be put out of business *as companies* by this growing economic pressure. But they may be forced to move in directions different from those that have nurtured them in the

past. They may have to concentrate into a quasi-mass production industry; and, in so doing, abandon an important part of the specialty steel industry to our friends across the seas, who are getting ready and are eager to take it back. The threat of which I speak may not be so much one of concern to the specialty steel companies as it can be to the Country as a whole.



I do not believe the American People want to be dependent upon Europe for the metals that are essential for survival in war and continued technological advancement in peace. I do not believe they will want to maintain the industry, either by government subsidy and control, or to tolerate for a moment a monopoly of one or two survivors. I believe they will want to permit it to live and continue, by free competition and free opportunity, to work and to serve.



On behalf of Crucible, I wish to thank you again for the honor you have done us, and for the opportunity to discuss our problems with you.



We hope the Crucible president *of the Year 2,000* will be invited to address the American Newcomen of that time, and that he will be able to report that the problems confronting the industry in 1950 were not so tough after all; and that, while there was still time, ways were found to carry on *all* our special industries, both great and small, in the ways that helped to make and keep this Country *great!*

THE END

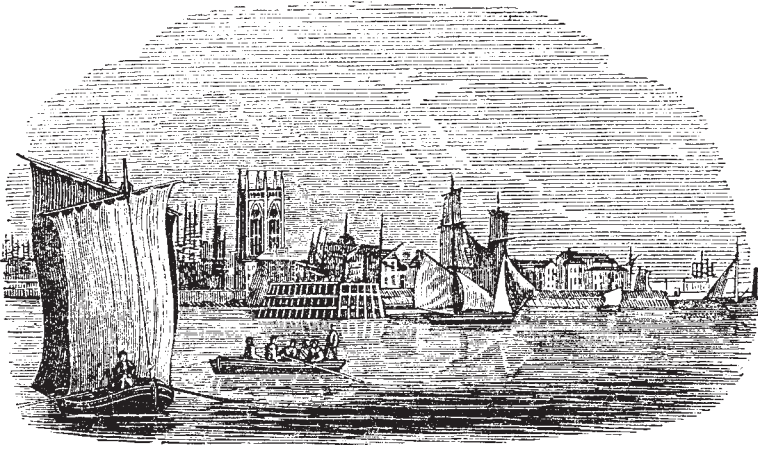


*"Actorum memores simul affectamus Agenda!"*



THE NEWCOMEN ADDRESS, *dealing with the beginnings and growth and contributions of Crucible Steel Company of America and celebrating its 50th Anniversary (1900-1950), was delivered at a National Newcomen Dinner of The Newcomen Society of England, held in the Ball-room of The Pierre, at New York, N.Y., U.S.A., on March 28, 1950. MR. COLVIN, the guest of honor, was introduced by CHARLES R. COX, President, Kennecott Copper Company; member of the New York Committee, in American Newcomen. The dinner was presided over by the SENIOR VICE-PRESIDENT FOR NORTH AMERICA, in this international Society whose headquarters are at London.*

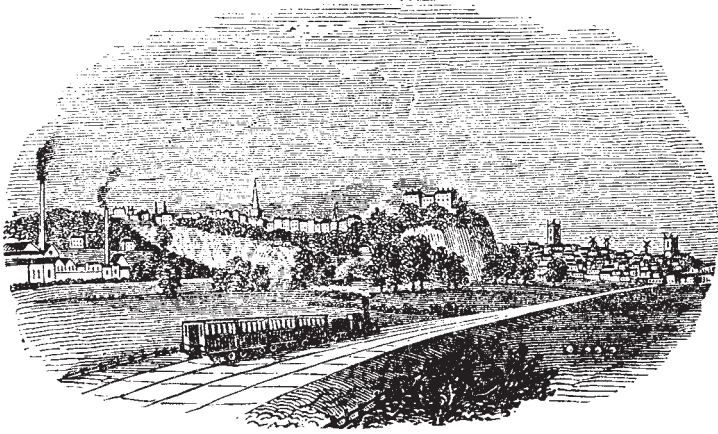




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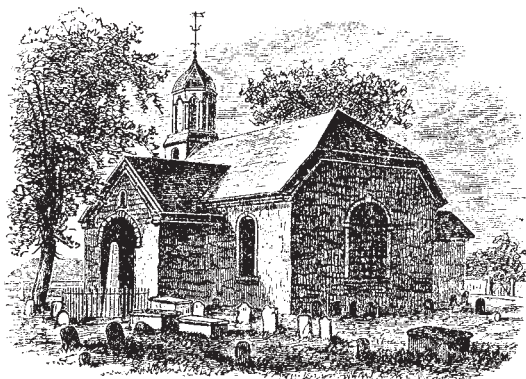




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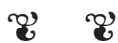
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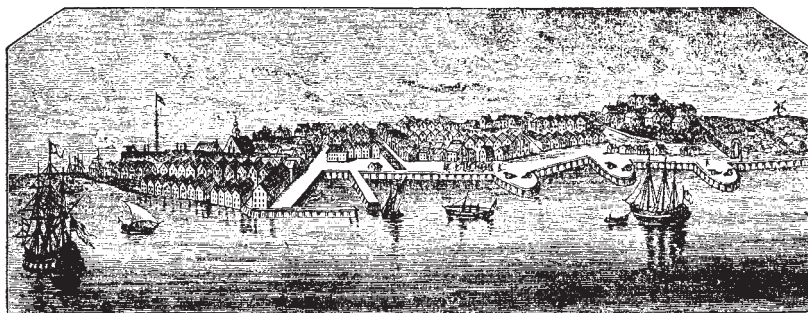




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AMERICAN NEWCOMEN, *interested always in industrial history and in any record of distinguished contributions to economic and material progress, takes satisfaction in this Newcomen manuscript, dealing with inventive genius and with the development of new processes and new and specialized products born of research and experience. The manuscript marks the 50th Anniversary of the Crucible Steel Company of America. It is a recital bringing into the light those factors and circumstances that affect this branch of the Steel Industry—and it stresses situations to be weighed, right at this time, in the national interest.*





## THE NEWCOMEN SOCIETY OF ENGLAND

### IN NORTH AMERICA

**B**ROADLY, *this British Society has as its purposes: to increase an appreciation of American-British traditions and ideals in the Arts and Sciences, especially in that bond of sympathy for the cultural and spiritual forces which are common to the two countries; and, secondly, to serve as another link in the intimately friendly relations existing between Great Britain and the United States of America.*

*The Newcomen Society centers its work in the history of Material Civilization, the history of: Industry, Invention, Engineering, Transportation, the Utilities, Communication, Mining, Agriculture, Finance, Banking Economics, Education, and the Law—these and correlated historical fields. In short, the background of those factors which have contributed or are contributing to the progress of Mankind.*

*The best of British traditions, British scholarship, and British ideals stand back of this honorary society, whose headquarters are at London. Its name perpetuates the life and work of Thomas Newcomen (1663-1729), the British pioneer, whose valuable contributions in improvements to the newly invented Steam Engine brought him lasting fame in the field of the Mechanic Arts. The Newcomen Engines, whose period of use was from 1712 to 1775, paved a way for the Industrial Revolution. Newcomen's inventive genius preceded by more than 50 years the brilliant work in Steam by the world-famous James Watt.*





*“The roads you travel so briskly  
lead out of dim antiquity,  
and you study the past chiefly because  
of its bearing on the living present  
and its promise for the future.”*

—LIEUTENANT GENERAL JAMES G. HARBORD,  
K.C.M.G., D.S.M., LL.D., U.S. ARMY (RET.)

(1866-1947)

*Late American Member of Council at London  
The Newcomen Society of England*

